Government of Rajasthan

Environmental Management Guidelines and Action Plan of SWRPD for Water Sector in Rajasthan

(Under Rajasthan Water Sector Restructuring Project)

State Water Resources Planning Department
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PREFACE

The key environmental challenges that the country faces relate to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. These challenges are intrinsically connected with the state of environmental resources, such as land, water, air, and their flora and fauna. It is increasingly evident that poor environmental quality has adversely affected human health.

As water has vital importance for human and animal life, maintaining ecological balance and for economic and developmental activities of all kinds. It is a scarce and precious resource. Planning, development, operation and maintenance of all water resources is of utmost importance to support the growth of the state economy and the well being of the population, in response to the growing need for drinking water, agricultural products, industrial production and electricity, a general improvement of living conditions and employment. Water sector involves cross-sect oral issues such as municipal, agriculture, irrigation, health, industries etc therefore an integrated and multi-disciplinary approach must be used for planning, formulation and implementation of water sector projects. A strong network and database is the basic requirement for better planning and management of water resources.

It was realized by the State Government that in the absence of regular coordination resource planning and management will not be achieved. It is preferable to prevent environmental damage from occurring in first place rather than attempting to restore degraded environmental resources after the fact. The State Water Resources Planning Department (SWRPD) was established to achieve an integrated and multi-sect oral approach to the planning, development and use of the State's Water Resources.

Environmental Issues in Water Sector issues related to water sector are identified. These issues cover water quality, quantity, demand, extraction, water logging pesticides, forestry, health and impact of construction on water sector. A management plan, policy guidelines etc. are required to take care of these issues. Since these issues are looked after by various departments in the state therefore, an integrated planning of environmental management and related sector specific guidelines are required.

SWRPD is the coordinating agency for water management involving all stakeholders. Some issues are within the purview of the department, specific action plan is required for its management and on others it will require data/information from other departments. This Action Plan has been prepared in view of the critical issues. World Bank has also reviewed this document and conveyed its "no objection".

Comments/Suggestions are welcome.

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1. BACKGROUND

Water has vital importance for human and animal life, maintaining ecological balance and for economic and developmental activities of all kinds. It is a scarce and precious resource. Planning, development, operation and maintenance of all water resources is of utmost importance to support the growth of the state economy and the well being of the population, in response to the growing need for drinking water, agricultural products, industrial production and electricity, a general improvement of living conditions and employment. Water sector involves cross–sect oral issues such as municipal, agriculture, irrigation, health, industries etc therefore an integrated and multi-disciplinary approach must be used for planning, formulation and implementation of water sector projects. A strong network and database is the basic requirement for better planning and management of water resources.

2. ENVIRONMENTAL FEATURES OF RAJASTHAN

The environmental features of Rajasthan are discussed below for understanding of the environmental status and management of the issues.

Located in the North West part of India, Rajasthan has geographical area of 342,239 km^2. The state can be divided into four major physiographical regions namely the Western Desert, the Aravalli hills-running south west to north east, Eastern Plain and South Eastern Plateau.

2.1 Climate

The Climate of the state varies from semi arid to arid and can be broadly classified into four distinct seasons as:

- Pre-monsoon, which is the hot season preceding the monsoon and extends from March to June. In summer the average temperature ranges from 25° to 46° C.

- The monsoon occurs in the month of June in the eastern region and mid-July in the western arid regions. Rainfall distribution is highly variable, both in time and space. Annual rainfall across the state varies from more than 900 mm in the southeastern part to less than 100 mm in the west.
- The Post-monsoon commences from mid-September to December
- Winter season extends from December to February, January being the coldest month of the year. Minimum temperature in winter ranges from 2° to 10° C

2.2 Agriculture

Rajasthan is predominantly agrarian state and 70 % of the population's livelihood is dependent on agricultural-based activities. The state is divided into ten Agro-Climatic Zones given in the table below.

Table 1: Agro-climatic Zones of Rajasthan

S. No.	Agro-climatic Zone	Regions	Districts	Average Rainfall (in mm.)
1.	IA-Arid Western	Jodhpur	Jodhpur (Jodhpur, Phalodi,Shergarh, Osian) Barmer	200-370
2.	IB-Irrigated North Western Plain	Ganganagar	Ganganagar , Hanumangarh	100-350
3.	IC-Hyper Arid Irrigated Western Plain Partially	Ganganagar Jodhpur	Jaisalmer ,Jodhpur ,Churu (Sujangarh,Ratangarh,Sardarshahar, Dungargarh)	100-300
4.	IIA-Transitional Plain of inland drainage	Jodhpur	Nagaur ,Sikar, Jhunjhunu Churu (Taranagar, Churu, Rajgarh)	300-500
5.	IIB-Transitional Plain of Luni	Jodhpur	Pali , Jalore , Jodhpur (Bilara, Bhopalgarh, Reodhar, Sirohi, Shivganj)	300-500

S. No.	Agro-climatic Zone	Regions	Districts	Average Rainfall (in mm.)
	Basin			
6.	IIIA-Semi Arid Eastern Plain	Jaipur Kota	Ajmer, Jaipur , Dausa , Tonk	500-700
7.	IIIB-Flood Prone Eastern Plain	Bharatpur	Alwar , Bharatpur , Dholpur Karoli (Toda Bhim, Karoli, Nadauti, Sapotara, Hindaun) Sawai Madhopur (Bamanwas, Bauli, Gangapur)	500-700
8.	IVA-Sub humid Southern Plain	Bhilwara Udaipur Jodhpur	Rajsamand , Bhilwara Chittorgarh (except Bari Sadari, Pratapgarh, Arnod, Choti Sadari) Udaipur (except Dhariyabad, Salumber, Sarada) Sirohi (Abu Road, Pindwara)	500-900
9.	IVB-Humid Southern	Udaipur	Dungarpur , Banswara , Bhilwara Udaipur (Dhariyabad,Salumber,Sarada) Chittogarh (Bari Sadari, Pratapgarh, Arnod, ChotiSadari)	500-1100
10.	V-Humid Southern Eastern Plain	Kota	Jhalawar , Kota , Bundi , Baran Bharatpur Sawai Madhopur (Khandar, Sawai Madhopur)	650- 1000

Source: Department of Agriculture Rajasthan

The crops grown are cereals, pulses oil seeds and other cash crops.

Cereals: Bajra, Jowar, Wheat, Maize, Barley Rice and Small Millets

Pulses: Gram, Tur, Moong

Oil Seeds: Sesamum, Rape & Mustard, Linseed, Groundnut and Castor

Others: Cotton, Sugarcane, Tobacco, Chillies, Potatoes, Isabgol, Coriander, Cumin, Fenugreek, Mehndi, Fruits and Vegetables

2.3 Water Resources

The surface water resource is scarce and confined to south and south eastern part of the state. Chambal and Mahi are the two perennial rivers of the state, other rivers are rainfed. The state is divided into 14 river basins and outside basin, the salient features of the basin is given in the table below

Table 2: Salient features of River Basins

Basins	Location	Districts	Catchment Area	Tributaries
Banas	East Central Rajasthan	Jaipur, Dausa, Ajmer, Tonk, Bundi, Sawai Madhopur, Udaipur, Rajsamand, Bhilwara, Chittorgarh	45,833 km^2	Berach Menali Kothari, Khari, Dai, Dheel, Sohadara, Morel Kalisil
Banganga	North-eastern Rajasthan	Alwar, Jaipur, Dausa, Sawai Madhopur, Bharatpur	8,878 km^2	-
Chambal	Eastern Rajasthan	Chittorgarh, Bhilwara, Bundi, Sawai Madhopur, Tonk, Jhalawar, Kota, Baran, Dholpur	31,460 km^2	Alnia, Kalisindh, Parwan, Mej, Chakan, Parwati, Kunu
Gambhir	North-eastern Rajasthan	Sawai Madhopur, Bharatpur, Dausa, Dholpur	4,174 km^2	Sesa, Kher and Parbati
Luni	South-western Rajasthan	Ajmer, Barmer, Jalore, Jodhpur, Nagaur, Pali, Rajsamand, Sirohi, Udaipur	37,363 km^2	Sukri, Mithri, Bandi, Khari, Jawai, Guhiya Sagi and Jojari river

Basins	Location	Districts	Catchment Area	Tributaries
Mahi	South-eastern Rajasthan	Banswara, Chittorgarh, Dungarpur, Udaipur	16,985 km^2	Eru, nori, Chap, Som, Jhakham, Moran, Anas, Gomti, Bhadar
Parbati	Eastern Rajasthan	Dholpur, Bharatpur, Sawai Madhopur	2,388 km^2	Sairni, Bamni, Mendka
Ruparail	North-eastern Rajasthan	Alwar, Bharatpur	3,855 km^2	A number of smaller streams rise e.g. the Narainpur, Golari, Sukri, Shanganga and Nalakroti rivers
Sabarmati	Southern Rajasthan	Dungarpur, Udaipur, Sirohi, Pali	4,164 km^2	-
Shekhawati	North-eastern Rajasthan	Ajmer, Alwar, Jaipur, Jhunjhunu, Nagaur, Sikar	11,522 km^2	Kantli, Mendha
Sabi	North-eastern Rajasthan	Alwar, Jaipur, Sikar	4,442 km^2	-
West Banas	South-western Rajasthan	Sirohi	1,798 km^2	-
Sukli	South-western part of Rajasthan	Sirohi	947 km^2	-
Other Nallah	Southern Part of Rajasthan	Jalore, Sirohi	1,968 km^2	-
Outside Basin	Northern and western part of Rajasthan	Barmer, Bikaner, Churu, Ganganagar, Hanumangarh, Jaisalmer, Jhunjhunu, Jodhpur, Nagaur, Sikar	1,66,464 km^2	-

Source: Water Resource Planning for the State of Rajasthan, Main Report, Vol-2, 1998

The lakes of Rajasthan are given in the table below.

Table 3: Lakes of Rajasthan

S. No	District	Lakes
1	Ajmer	Aana Sagar, Phai Sagar, Pushkar,
2	Alwar	Rajsamand, Siliser
3	Bheelwada	Ummed Sagar, Mandlis,
4	Bikaner	Gajner, Anup Sagar, Sursagar, Kolayataji
5	Bundi	Nawlakha Lake
6	Churu	Chapartaal
7	Dhaulpur	Talaabshahi
8	Dungarpur	Gauravsagar
9	Jaipur	Galta , Chaaparwada
10	Jaisalmer	Dharsi Sagar Gadisar, Amar Sagar, Bujh Lake
11	Jodhpur	Balsamand, Pratap Sagar, Ummed Sagar, Kayelana, Takht Sagar,
12	Pali	Bankli, Sardar Samand
13	Sirohi	Nakki Lake (Mount Abu)
14	Udaipur	Jaisammand, Rajsammand, Udaisagar, Fateh Sagar, Swaroop Sagar, Pichola

Source: Department of Agriculture Rajasthan, 2007

Water demand in Rajasthan is mainly met from ground water resources. Ground water exploitation has caused depletion in water level. According to the Report "Ground Water Behaviour in the State" (December 2005), prepared by GWD, during the period 1995 to 2005, average ground water table in 28 districts has shown decline, ranging from (-) 0.26m in Banswara to 12.93m in Jalore. In 8 districts namely Ajmer, Alwar, Barmer, Dausa, Jaipur, Jalore, Jhunjhunu, Jodhpur, Nagaur, Pali, Rajsamand, Sikar, Sawai Madhopur and Sirohi, average decline in ground water level has been more than 4m. In rural area irrigation is the main cause of decline in ground water level, in urban areas it is due to public water supply.

2.4 Forest and Wildlife

Most of the forests are over the hilly areas i.e. in Udaipur, Rajasamand, Kota, Baran Sawai Madhopur, Chittorgarh, Sirohi, Bundi, Alwar, Jhalawar and Banswara districts, which make up for about 50 per cent of the forests of the state. Dense natural forests are in protected patches, mostly confined to national parks and wild-life sanctuaries. The western half is desert terrain and devoid of forest cover. The forests of state can be divided into four broad forest types;

i. Tropical Thorn Forests,
ii. Tropical Dry Deciduous Forests,
iii. Central India Sub-tropical Hill Forests.

iv. Mixed Miscellaneous Forests

Tropical Thorn Forests

Tropical thorn forests are found in arid and semi-arid regions of western Rajasthan. These extend from western Indo -Park border and gradually merge with the dry deciduous mixed forests of the Aravalli hills and the south-eastern plateau. The main species found in this kind of forests are *Acacia nilotica, Acacia leucophloea, Prosopis cineraria, Capparis aphylla, Zizyphus spp., Flacourtia spp.* etc. These forests are basically found in western part of Rajasthan namely Jodhpur, Pali, Jalore, Barmer, Nagaur, Churu, Bikaner etc.

Tropical Dry Deciduous Forests

These forests are mostly found in small patches in few parts of the state, the northern and eastern slopes of Aravalli ranges, mostly Alwar, Bharatpur and Dholpur districts are covered with this type of forests. Sporadic growth of dry deciduous forests is found along the dry river beds of Jalore, Nagaur, Ganaganagar and Bikaner, districts.The main species found in this kind of forests are *Anogeissus pendula, Anogeissus latifolia, Acacia catechu, Terminalia tomentosa, Terminalia balerica, Terminalia arjuna, Boswellia serrata, Dendrocalamus strictus, Lanea grandis.*

Central Indian Sub - Tropical Hill Forests

These forests which are most abundant in central India, as in Madhya Pradesh, parts of Gujarat and Maharashtra, are found in Sirohi district of Rajasthan also, mostly on the hills girding Mt. Abu. These forests have semi-evergreen and some evergreen species of trees. The vegetation of Mt. Abu consists of many plants which are similar to the sub - tropical region of Himalayas. Around Mt. Abu, they are well represented between 700 to 800 m altitudes.

Mixed Miscellaneous Forests

These forests are mostly found in south easten and easten part of Rajasthan comprising Chittorgarh, Kota, Udaipur, Sirohi, Banswara, Dungarpur, Baran and Jhalawar distrists.
These Forests mainly have *Anogeissus pendula, Anogeissus latifolia, Terminalia tomentosa, Terminalia arjuna, Terminalia chebula, Albizia lebbeck and Dalbergia paniculata.*

According to the legal status, the forests of the State can be classified as:

- Reserve Forest
- Protected Forest
- Un-classed Forest

Table 4: Legal Status of Forest in the Districts of Rajasthan, 2005

Name of District	Geographic Area (Km2)	Reserved Forest	Protected Forest	Unclassified Forest	Total Forest	District area under forest (%)
Ajmer	8481	194.99	417.99	0.120	613.10	7.2
Alwar	8380	1006.06	636.83	141.250	1784.14	21.3
Banswara	5037	0.00	1236.67	0.000	1236.67	24.6
Baran	6992	0.00	2226.74	4.970	2231.71	31.9
Barmer	28387	0.00	568.33	40.770	609.10	2.1
Bharatpur	5066	0.00	369.57	12.820	382.39	7.5
Bhilwara	10455	433.68	289.54	74.050	797.27	7.6
Bikaner	27244	0.00	234.29	968.650	1202.94	4.4
Bundi	5776	801.98	693.34	13.850	1509.17	26.1
Chittoragarh	10856	1585.10	1180.96	0.470	2766.53	25.5
Churu	16830	7.20	10.84	53.180	71.22	0.4
Dausa	3432	133.37	148.69	0.570	282.63	8.2
Dhaulpur	3033	7.92	597.78	32.750	638.45	21.1
Dungarpur	3770	257.08	423.33	13.970	694.38	18.4
Ganganager	10978	0.00	50.65	582.790	633.44	5.8
Hanumangarh	9656	0.00	113.25	126.210	239.46	2.5
Jaipur	11143	697.34	263.10	5.630	948.07	8.5
Jaisalmer	38401	0.00	155.15	383.080	538.23	1.4
Jalore	10640	104.86	291.80	36.220	432.88	4.1
Jhalawar	6219	954.14	391.15	0.430	1345.72	21.6
Jhunjhunu	5928	6.02	392.57	6.770	405.36	6.8
Jodhpur	22850	4.67	140.35	100.260	245.28	1.1
Karauli	5524	62.99	1675.55	63.520	1802.06	32.6
Kota	5217	943.06	440.38	16.340	1399.78	26.8
Nagaur	17718	0.80	206.23	33.890	240.92	1.4
Pali	12387	818.24	136.56	6.00	960.800	7.8
Rajsamand	3860	277.43	119.14	0.00	396.57	10.3
S.Madhopur	4498	826.73	138.33	27.070	992.13	22.1
Sikar	7732	9.92	619.18	8.590	637.69	8.2

Name of District	Geographic Area (Km2)	Reserved Forest	Protected Forest	Unclassified Forest	Total Forest	District area under forest (%)
Sirohi	5136	614.04	984.72	0.00	1598.76	31.1
Tonk	7194	101.34	228.84	1.380	331.56	4.6
Udaipur	13419	2947.51	1628.18	5.540	4581.23	34.1
TOTAL	**342239**	**12778.47**	**17010.03**	**2761.140**	**32549.64**	**9.5**

Source: Rajasthan Forest Department Report, 2005

2.5 Fauna & Protected Areas

Rajasthan gives shelter to a variety of animals and birds. Important fauna of Rajasthan is given in **Table 7.5**

Table 5: Fauna of Rajasthan

S. No	Scientific Name	Common Name
1.	*Panthera tigris*	Tiger
2.	*Panthera pardus*	Panther
3.	*Melursus ursinus*	Sloth Bear
4.	*Hyaena hyaena*	Hyena
5.	*Sus scrofa*	Wild Boar
6.	*Gazelle gazelle*	Chinkara
7.	*Bosephalus tragocamelus*	Nilgai
8.	*Felis chaus*	Jungle Cat
9.	*Felis silvestris ornata*	Indian Desert Cat
10.	*Canis aureus*	Jackal
11.	*Presbytis entellus*	Langur
12.	*Macaca mulata*	Rhesus monkey
13.	*Meriones hurruianae*	Desert Gerbil
14.	*Herpestes edwarsi*	Mongoose
	Pteropus giganteus	Bat

There are 5 National Parks and 23 Wildlife Sanctuaries in Rajasthan (Wildlife Institute of India, June 2008) covering an area of 4122.33 km^2 and 5447.03 km^2 respectively. The salient features of the National Parks are given in the table below.

Table 6: Salient Features of National Parks

S. No	National Parks	Area (km^2)	Habitat	Wildlife Present
1.	Ranthambhore NP	392	Tropical dry deciduous forests and conjunction of hilly terrain of Aravalli and Vindhyan Mountains	Tiger, Panther, Chital, Sambhar, Blue Bull, Jackal, Jungle Cat, Caracal, Wild Boar, Chinkara & Tree Pie, Cuckoo, Fly Catcher birds, Warblers, Parakeets etc
2.	Keoladeo Ghana NP	28.73	Wetland	375 species of Birds, Cheetal, Sambhar, Hyena, Jackal, Jungle Cat, Vulture,etc
3.	Darrah NP	265.8	Hilly area	Panther, sloth bear, hyaena, Jackal, Cheetal, Chinkara, Wolf , Wild Boar,etc.
4.	Sariska NP	492	Hilly area of Aravalli	Tiger, Panther, Wild Boar. Sambhar Jungle Cat, Cheetal, Porqupine, Hyaena, etc
5.	Desert NP	3162	Part of Sind and Thar Desert (Desert grassland and open Scrub-field)	Chinkara, Desert Hare, Blackbuck, Desert Snake, Great Indian Bustard, Imperial Sandgrouse, Desert reptiles, Fox and Vultures, etc

There are 55 major wetlands, which occupy 1230 km^2 of area. Two of the wetlands have been listed under the Convention on Wetlands of International Importance (Ramsar Conventions). These sites are the Keoladeo National Park Ghana (in district Bharatpur) and the Sambhar Lake (in district Nagaur). Keoladeo is India's most important bird sanctuary where migratory species like the Spoonbills, Herons, Cormorants, Storks, Openbills, Ibis and Egrets pay visit in winter.

3 INSTITUTIONAL APPROACH FOR INTEGRATED PLANNING

There are several departments and agencies involved in the development, use and monitoring of water resources. The important ones are Irrigation Department, Agriculture Department, Command Area Development Department, State Ground Water Department, Public Health Engineering Department, State Pollution Control Board, Department of Industries and Department of Environment and Forest. All these departments and agencies are working in their respective areas according to their mandates, but it was realized by the State Government that in the absence of regular coordination among the departments / agencies, the overall desired goal of integrated water resource planning and management will not be achieved. The State Water Resources Planning Department (SWRPD) was created to achieve an integrated and multi-sect oral approach to the planning, development and use of the State's Water Resources. The main objectives of the department are:

- To develop methodology for achievement of state water policy objectives.
- Assure integrated and multi disciplinary planning and implementation of all surface and groundwater development activities.
- To work for achieving judicious water allocation to all stakeholders in accordance with the state water policy , and for establishing a proper regulating mechanism for efficient water use in the state.
- To enhance and encourage water conservation and efficient water use practices through participatory approach and promote water regulations with acceptable water pricing structures.
- To facilitate public participation and NGO initiatives in water sector development.
- To work for achievement of the minimum level of water availability and services with respect to time and quantity ensuring good water quality standards not only for the present generation but also for the generation to come.

- To develop institutional mechanism for water planning and decision making involving all the stakeholder, to facilitate resolution of conflicts related to water issues and to advise on the of State Water Plan.
- To collect data on water resource availability, use, quality and make them accessible to all, to promote sustainable development of water resources in the basins and sub basins of the state.
- To promote awareness and understanding for economical and efficient use of water in drinking, industrial and agriculture use by spreading consciousness through training and use of mass media along with pilot demonstration projects etc.
- To inform the statutory authorities charged with planning and utilization of natural resources, responding emergencies(floods and droughts), or establish sector policies plans or targets (such as agriculture, drinking water supply, energy, afforestation etc.) about the water resources implications or requirements for their plans, and policies.
- To ensure well-coordinated and efficient decision making in planning, design, execution and operation and maintenance within government and private agencies working in water sector in Rajasthan.

For management of environmental issues separate units have been formed under SWRPD, Environmental Department and Irrigation Department.

(a) Environmental Policy Planning Unit (EPPU)

EPPU was formed under SWRPD with the responsibility for preparation of Environmental policy and strategy for water management. The Unit identifies issues and develops programs on environmental awareness for various target groups, prepares operational guideline for EIA and implementation for water projects, define guidelines on management of environmental flow and support IT & GIS in SWRPD in applying technologically efficient analysis.

(b) Water Cell (WC)

WC was formed in Environmental Department for monitoring the implementation of policies / strategies/ guidelines / programs developed by Environment Policy Planning Unit (EPPU). The cell implements environmental awareness programs on issues identified by EPPU. It also contributes to policy function of SWRPD.

(c) Environmental Cell (EC)

EC was formed within Irrigation department. The aim of EC is to strengthen the environmental management capacity of Irrigation Department. The EC works with EPPU for preparation of operational guidelines and procedures for the environmental impact assessment and management of irrigation projects. The cell is also responsible for

implementation of basin wise EMPs. Three regional cells of EC have been formed which are located at Jaipur, Kota and Udaipur.

4. POLICY AND LEGAL ASPECTS

The policies and laws applicable and/or related to water sector development of the state of Rajasthan are listed below along with a brief description of their relevance;

- **The National Water Policy, 2002**

  National level policy addresses the water issues including prioritization, allocation, pricing and interstate issues related to water sharing. Policy states about the consumptive use of water, water conservation and quantification of water pollution.

- **The National Environment Policy, 2005**

  National Level policy deals mostly with the issues related to the control and regulation of environmental degradation. Policy underlines the need of water conservation and appropriate management. It also states integrated water resource management.

- **The Rajasthan State Water Policy (5th Draft), 2006**

  The latest water policy under formulation as a revised version of the earlier Rajasthan State Water Policy, 1999.Policy has priority for drinking water both for domestic and commercial use but also indicates Environment & Ecology sector as one the priority in water allocation. It attempts to quantify water pollution.

- **Sector Policy for Rural Drinking Water & Sanitation (Draft) -2005**

  The state level policy dealing with the process and quality of drinking water supply and sanitation means in different areas of the state, mostly in rural sectors. Policy links water harvesting practices in households and community. It assigns duties and responsibilities of PRIs and NGOs in source development and water allocation. It stresses awareness for development of optimal and efficient use of drinking water.

- **State Policy for Forest Development**

  The state level policy on forest development deals with provisions of afforestation, wildlife conservation, development of forest communities etc. Combating desertification by undertaking various measures, such as, in-situ soil and water conservation and water harvesting, sand dune stabilisation and promoting combined production systems, namely, agro-forestry, silvi-pastoral, agri-silvi-pastoral, agri-

horticultural systems Provisions have been made for providing support services to farmers for promotion of agro-forestry through system of incentives.
• **The Rajasthan Industrial Policy, 1998** This State Level policy deals with regulation and provisions of industrial infrastructural facilities to industrial sectors. Water is considered as one of the most important sector prioritized after power and communication. Common Effulent Treatment Plants for large industries have been stated and State Pollution Control Board is stated to be associated for pollution checks and management.
• **The Resettlement and Rehabilitation Policy for Water Sector Development** This specific policy on Resettlement &Rehabilitation (R&R) issues, facilitates project implementation by paving the way for R&R in case of Water Sector development projects. This policy envisage compensation to displaced families under different infrastructure projects including the water sector projects.
• **Urban Development & Housing** This policy specifically deals with urban development and house establishment in the state along with provisions of infrastructural facilities to be provided to the developers. Its relevance in water sector is w.r.t solid waste management.

Laws & Regulations:

Some of the important Acts related to Water Management at national and state level are given below.

NATIONAL ACTS
• **The Water (Prevention and Control of Pollution) Act 1974, (Amended -1988)** An Act to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, for the establishment, with a view to carrying out the purposes aforesaid, of Boards for the prevention and control of water pollution, for conferring on and assigning to such Boards Powers and functions relating thereto and for matters connected therewith.
• **The Water (Prevention and Control of Pollution) Cess Act, 1977 (Amended - 1992 and 2003)** An Act to provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974.
• **Environment Protection Act, 1986** Most significant and diversified National level Act to safe guard the natural environment. It has several rules under it, to address different problems like hazardous waste disposal, plastic use and disposal etc.

- **EIA Notification, 2006**

  The latest version of EIA notification, which makes an EIA study mandatory for any water sector development project having more than 10000 ha of command area and power production > 25 MW

STATE LEVEL ACTS

- **The Rajasthan Irrigation and Drainage Act and Rules, 1954**

  This act deals with the issues related to the irrigation and drainage, to maintain the quality aspects of the surface and ground water resources.

- **Participation In Management of Irrigation System (PIM) Act, 2000**

  It provides options for farmers participation in the Management of Irrigation System and for matters connected with the same.

- **The Rajasthan Minor Irrigation Works Act**

  This act deals with critical issues related to the minor irrigation works in the state.

- **The Rajasthan Regulation and Control of The Development and Management of Ground Water Bill, 2006 (Draft)**

  This bill deals with establishment of State Ground Water Authority with the powers to notify areas and uses for regulation and control of the development and management of ground water.

- **The Rajasthan Forest Act**

  It regulates the state forest resource and management. Combating desertification by undertaking various measures, such as, in-situ soil and water conservation and water harvesting, sand dune stabilisation and promoting combined production systems, namely, agro-forestry, silvi-pastoral, agri-silvi-pastoral, agri-horticultural systems. Provisions have been made for providing support services to farmers for promotion of agro-forestry through system of incentives.

- **The Dam Safety Act of Rajasthan**

  Specifies the importance of dam regulation and responsibilities of State Dam Safety Organization. Dam Safety Legislation shall be enacted to ensure proper inspection, maintenance and surveillance of existing dams and also to ensure proper planning, investigation, design and construction for safety of new dams.

5. ENVIRONMENTAL ISSUES IN WATER SECTOR

The critical issues faced by water sector in Rajasthan are discussed below.

i. Water Quality

a) Surface Water Quality: There are two major sources of water pollution-sewage water and industrial effulent. None of the towns of the State, except Jaipur have sewage collection, treatment and disposal system. Under Phase –I, Rajasthan Urban Infrastructure Development Project (RUIDP) is undertaking construction of sewage system along with treatment plant in five major cities of Jodhpur, Kota, Ajmer, Udaipur and Bikaner. Under Phase –II RUIDP will cover fifteen towns namely Alwar, Baran-Chhabra, Barmer, Bharatpur, Bundi, Churu, Chittorgarh, Dholpur, Jaisalmer, Jhalawar-Jhalarapatan, Karauli, Nagaur, Rajsamand, Sawai Madhopur and Sikar.

In uncovered towns, the sewage and sullage water is carried through open drains running along the roads and it is ultimately discharged in to a nala/tank or river. Construction of septic tanks without sewerage system is a common practice in towns

CPCB has identified highly polluting industries in Rajasthan which includes textile, cement, distilleries, fertilizer, pharmaceuticals, and thermal power plants. Industrial water pollution in the state is mainly confined to Kota, Alwar, Udaipur, Jodhpur, Pali, Balotra, Sanganer, Bhilwara, Jhotwara and Bagru.

Large industries have their own Effluent Treatment Plants. Small scale industries located in and around urban areas do not have treatment facilities.The Govt has planned Common Effluent Treatment Plants (CETP) for treatment of the effluents. CETP are installed in Industrial areas in Pali (3), Balotra(1), Jodhpur(1), Bhiwadi (1) and Manpura Machhedi- Jaipur (1).

CETPs are also constructed in Jasol , Balotra and under construction in Bithuja. The three CEPTs of Pali are also proposed for upgradation

b) Ground Water Quality: The major problem associated with ground water quality is of fluoride, nitrate and salinity . The worst affected districts are given in the table below.

Table 7: Worst Affected Districts (50 % or more)

Fluoride > 1.5 mm	**Nitrate>100 ppm**	**TDS > 2000 ppm**	**Iron> 1.0 ppm**
Tonk, Churu, Barmer, Pali, Sirohi, Jalore, Rajasmand	Churu, Nagaur,Jhunjhunu	Churu, Barmer, Bharatpur	Bhilwara, Jodhpur, Baran and Jaipur

Salinity Problem- 21,190 villages/habitations mostly from the districts of Churu, Bharatpur, Barmer, Jhunjhunu, Nagaur and Ajmer suffer from the problem of excessive salinity.

Fluoride Problem- 11,909 villages/habitations suffer from excess fluoride problem. The problem has serious proportions in the districts of Jaipur, Tonk, Nagaur, Ajmer, Bhilwara, Sirohi and Pali.

Nitrate- 20,659 villages/habitations suffer from excess Nitrate problem. The worst affected districts are Jaipur, Nagaur, Barmer, Udaipur, Jodhpur, Churu, Alwar and Tonk.

ii. Overexploitation of Ground Water

The ground water resources in the state are shrinking continuously due to excessive extraction of ground water- nearly 90 per cent of the drinking water supplies and 60 per cent of the irrigation water is extracted from ground water. Increase in ground water draft during 1984-2004 is about 165 % with an average yearly increment of 8.25 %. The decline in the number of blocks with safe levels of exploitation of ground-water and the corresponding increase in critical and over-exploited categories is shown in the Table below.

Table 8: The Status of Ground Water Resources in Rajasthan

Year	**Total no of blocks in State**	**No of Blocks in Different Categories (% of area under different blocks)**			
		White (Safe)	**Grey (Semicritical)**	**Dark (Critical)**	**Over Exploited**
1984	**236(1 block not**	203(86%)	10 (4%)	11 (5%)	12 (5%)

Year	Total no of blocks in State	No of Blocks in Different Categories (% of area under different blocks)			
		White (Safe)	Grey (Semicritical)	Dark (Critical)	Over Exploited
	assessed)				
1988	**226(11 blocks not assessed)**	122 (53%)	42 (19%)	18 (8%)	44 (20%)
1990	**237**	148 (62.71 %)	31(13.14 %)	13 (5.51 %)	44 (18.64 %)
1992	**237**	149 (63.14 %)	19 (8.05 %)	15(6.36 %)	53 (22.46 %)
1995	**237**	127 (53.81 %)	35 (14.83 %)	14(5.93 %)	60 (25.42 %)
1998	**237**	135 (57.20 %)	34 (14.41 %)	26(11.02 %)	41 (17.37 %)
2001	**237**	49 (20.76 %)	21 (8.90 %)	80 (33.90 %)	86 (36.44 %)
2004	**237**	32 (14 %)	14 (6 %)	50 (21 %)	140 (59 %)

Source: Rajasthan Ground Water Department

Increase in water demand has brought 140 blocks into the overexploited category, 50 in critical 14 in semi critical and 32 as safe. In order to check the declining ground water resources the Govt. has made it mandatory to construct Roof -Top Rain Water Harvesting Structures in urban areas on plots measuring 300 sq.m and above and Storm Rain Water Harvesting along roads and pavements in urban areas.

iii. Water Demand

Increasing demand for water from domestic, irrigation and industrial sectors have created pressure on water resources of Rajasthan. Rajasthan is the driest state of the country. with a current population of 5.6 crores ,the overall population density has increased from 1050 persons per sq. km. in 1971 to 2242 in 1991 and 2952 by 2001 AD. Jaipur city which is a metropolis with a population of 23.24 lakhs has a decadal growth rate of 59.37 percent,is one of the highest growth rates amongst the metropolitan cities in India. The urban development agencies are unable to cope up with population growth and urban

sprawl. There is enormous pressure on public facilities like water supply, waste disposal, drainage and sewerage. As per survey by Census Deptt. in 2001 only 70 percent of the total households in urban areas have separate water connections and tap supply. Similarly 24 per cent of the household do not have adequate sanitation facility.

All the 183 municipal towns have piped water supply system provided by Public Health Engineering Department of State Government. The 42 towns located in canal irrigated area or near big reservoirs have surface water source, while 141 towns have to depend on ground water as source of supply. Water supply to 222 towns is being maintained by PHED. The condition of water supply is not satisfactory due to scarcity of water. Only 23 towns get more than 100 litres per capita of daily water supply against the desired standard of 135. 40 percent towns have below 60 LPCD supply and 30% towns have water supply between 81-100 LPCD.

Table 9: Position of Water Supply in Urban Areas

Per capita daily supply	No. of Towns	% of Total Town
Below 40 LPD	16	7.21
40 - 60 LPD	74	33.33
61 - 80 LPD	79	35.58
81 - 100 LPD	30	13.53
Above 100 LPD	23	10.35
Total	**222**	**100**

Source: PHED, Rajasthan

Irrigation demand has increased during the previous decades. Canals were the major source for irrigation in 1973 with 843701 hectares under irrigation, which amounted to 35% of the total land irrigated. In the year 2001-02 the area under canal irrigation increased to 1451783 hectares but its share in total area under irrigation reduced to 27%. As per Directorate of Economics and Statistics, Government of Rajasthan, the total irrigated land has increased by 128% between 1973-74 to 2001-02. The increase in irrigated area has been met by tube wells and wells, adding pressure on groundwater resources.

Irrigation presently uses 83 per cent of total water resources of the state. As a result of the increase in population, expected to double to 100 million by 2050, and water demand for non-agriculture purposes, the share of water for agriculture is set to reduce to 70 per cent by 2050. (Report of the Expert Committee on Integrated Development of Water Resources, June 2005)

Rajasthan has the highest livestock population in India, which translates into the highest demand for fodder and water as well. According to livestock

census of 2003 and 2007, has been an increase in 17.84% in the total livestock population. The total livestock population in the year 2007 is 57899870.

The Rajasthan State Industrial Development & Investment Corporation (RIICO) has developed 257 Industrial Estates including 6 Growth Centers and 10 Industry Development Centers in the State for providing infrastructure facilities like power, water, roads, along with other social and financial amenities to industrial units. RIICO has acquired 20089.7 ha land and has developed area of 14087.20 ha. The growth of industrialization causes increase in the water pollution and water demand. As per Tahal Report, industrial water demand in state was about 45.5 MCM/Yr in 1995 and projected as 138.44 MCM/Yr in 2045.

iv. Water Logging

The problem of water logging and salinity is prominent in Outside basin and Chambal basin. Soil Salinity is caused by a number of factors, but a major one is water table near the soil surface that prevents effective drainage thus allowing capillary action to bring salt into the plant root zone and to the soil surface. Water logging and salinity problem occurred due to the seepage from canals in Outside basin and over irrigation in Chambal basin. Irrigation from Indira Gandhi Nahar Pariyogna (IGNP) was started in 1962 in stage-I. Introduction of irrigation in the outside basin led to rise in water table leading to waterlogging and salinity.

The problem has been reclaimed in major parts of Chambal command area by introduction of subsurface drainage system. However the problem persist in the IGNP areas.

v. Forest Cover

The state is deficient in natural forest resources. The total forest area of the state is 32,488 km^2 which constitute 9.3% of geographical area of the state. Forests are mostly confined in eastern and southern parts of the state. The western part of the state is desert and is devoid of forest because of prevailing hot and arid condition. The status of forest cover is given in table below.

Table 10: Status of Forest cover of Rajasthan

Total Geographical area (km^2)	Very dense forest (km^2)	Moderate dense forest (km^2)	Open Forest (km^2)	Total Forest (km^2)	Percent of Geographical area
342,239	14	4,456	11,380	15,850	4.63

Source: State of Forest Report, 2005

Majority of rural people are dependent on forest resources for their day to day existence for food, household goods, fodder manure and shelter. Overgrazing by animals and mining is also adding pressure on the forest.

State Government under State Forestry Action Plan (1996-2016) has targeted to achieve 20 percent of area under tree cover by 2016. There are several programs taken by Forest Dept. for increasing the forest cover such as Desert Development Plan (DDP), Drought Prone Area Program (DPAP), annual forestry plan etc. There are about 4,224 JFM committee managing about 0.587 million ha forest area. The forest cover change matrix by Forest Survey of India shows an increment of 2 km^2 in moderately dense forest and 27 km^2 area in open forest in 2005 in comparison to 2003. The increase is in the forest cover of Bhilwara, Bundi, Ganganagar, Jaipur, Jaisalmer, Kota Pali and Udaipur districts on account of plantation work.

Besides Forest Dept. Watershed Development & Soil Conservation Department also take plantation program as part of watershed development.

vi. **Health and Sanitation**

Health aspect is one of the major concerns in environmental management. Health and hygiene is largely dependent on adequate availability of drinking water and proper sanitation. Consumption of unsafe drinking water, improper disposal of human excreta, improper environmental sanitation and lack of personal and food hygiene have been major causes of diseases such as amoebiasis, gastroenteritis, jaundice/ hepatitis and malaria in rural Rajasthan. There is low level awareness in rural areas regarding drinking water quality.

The Nationwide Total Sanitation Campaign (TSC) (launched by Department of Drinking Water Supply under Ministry of Rural Development, Government of India) shows status of Schools in Rajasthan. The sanitation coverage in schools in Rajasthan is above National average, refer table 7.8.

Table 11: Status in Schools Sanitation Coverage in Rajasthan

Parameters	Rajasthan	India
No. of Schools	63,623	8,35,916
Schools with Toilets	53.44%	43.16 %
Hand wash facility	49.41%	17.44 %
Drinking water supply	72.26%	66.39 %

Source: Baseline Survey Project Implementation Plan, TSC, Dept. of Drinking Water Supply, Ministry of Rural Development,

However Household Sanitation shows poor coverage in Rajasthan. Status of Household Sanitation coverage in Rajasthan is given below:

Table 12: Status of Household Sanitation coverage in Rajasthan

Parameters	Rajasthan	India
Total Households	78,91,284	13,00,45,603
Household Above Poverty Line (APL) With Toilets	16.13 %	25.94 %
Household Below Poverty Line (BPL) With Toilets	5.94 %	18.23%
Total Household APL + BPL With Toilets	13.50 %	22.42%

Source: Baseline Survey, Project Implementation Plan, TSC, Dept. of Drinking Water Supply, Ministry of Rural Development

vii. **Pesticide / Fertilizer Use**

The demand for increase in production has led to increased use of chemical /inorganic fertilizers, pesticides, high yielding varieties and mechanization of agriculture. The use of chemical fertilizers has been steadily increasing. These chemicals are causing water quality problems which affect the health of the people.

To check the use of pesticides Government has banned the use of harmful pesticides like DDT. Biofertilizer use is encouraged under soil conservation and watershed development programs. Agriculture Deptt. promotes Integrated Plant Nutrients Management (IPNM) and Integrated Pest Management (IPM) to combat the problem of Pesticides/ fertilizer use.
Fertilizer application through sprinkler saves labour in fertilization and help in optimum uptake of plant nutrients and enhance agricultural productivity. Subsidy has been offered on water saving devices sprinklers system and drip irrigation.

viii. **Construction Work**

The pace of development has lead construction of dams, industries, roads, public facilities and townships in Rajasthan. The construction activities extend pressure on water resources. The rapid population growth of the urban centres have resulted into unauthorized constructions. Such growth has taken in the urban centres specifically in big towns of Jaipur, Kota, Ajmer, Jodhpur, Udaipur, Bikaner, Bhilwara, Sriganganagar, Pali and Bharatpur. Impacts of construction activities on water bodies are:

- The construction of Dams involves submergence of land, clearing of land, displacement of inhabitants. Downstream water requirement is affected in operation phase.
- Local Drainage is affected during construction phase.

- Water pools formed which give foul odour and provide breeding ground for mosquitoes.
- Turbidity of water bodies rises.
- Irrigational canals are affected during construction phase, if any.
- Pollution of surface and groundwater occur due to seepage & runoff from construction site.

The Pollution control board is the regulatory body taking care of the quality aspect and has provided norms for water quality monitoring during construction phase.

Besides quality aspect the construction activities require lots of water which is met from GW in Rajasthan.

6. ENVIRONMENTAL MANAGEMENT GUIDELINES & ACTION PLAN FOR SWRPD:

State Water Resource planning Department (SWRPD) functions as an entity involved in policy, planning and issuing guidelines for the water sector in Rajasthan. Under the section 5, "Environmental Issues in Water Sector" issues related to water sector are identified. These issues cover water quality, quantity, demand, extraction, water logging, pesticides, forestry, health and impact of construction on water sector. A management plan, policy guidelines etc. are required to take care of these issues. Since these issues are looked after by various departments in the state therefore, an integrated planning of environmental management and related sector specific guidelines are required.

To enhance the monitoring of environmental aspects and identify an action plan for SWRPD, an attempt has been made through this document. These guidelines envisaged a suggested action plan for SWRPD, where SWRPD will act as a nodal agency for water sector planning will bring out major environmental concerns of water sector in Rajasthan and will publish related data information in public domain. This will not only improve environmental awareness and management in water sector of the state but, will also act as tool to strengthen SWRPD's data bases , environmental consciousness and management.

SWRPD is the coordinating agency for water management involving all stakeholders. Some issues are within the purview of the department, specific action plan is required for its management and on others it will require data / information from other departments. Based on this analogy, the document splits up the work of SWRPD in following two parts:

1. Environmental Monitoring and Management on issues which can be directly dealt at their own level
2. Environmental Monitoring where input and action required by other stakeholder Departments

The information shall be updated and provided by SWRPD as per Table **6.1 & Table 6.2** below for publishing and display on web site.

SWRPD will seek information in following manner;

(i) Environmental Management by SWRPD:

SWRPD shall seek district wise/ basin wise data / information, prepare and analyze data and take action to publish as per Table 6.1.

Table 13: Proposed Action Plan for SWRPD

S. No	Issues	Data / Information Required	Responsibility
1.	No. of projects in a basin	➢ No. of constructed Dams ➢ No. of Dams under construction ➢ No. of proposed schemes	SWRPD based on information from concerned department (WRD).
2.	Dam wise information	➢ Rainfall in the catchment area and dam site ➢ Water filled in the dam ➢ Water allocated for drinking, irrigation and other use ➢ No. of days water flowing in Main canal ➢ Net Area Irrigated ➢ Water quality of the dam ➢ Water released in Downstream – duration ➢ No., type and location of industries in the catchment area ➢ Construction activity – No and type of anicuts in catchment ➢ Preparation of Emergency Action Plan	SWRPD based on information from concerned department (WRD).
3.	Water Availability	➢ Water available in Basin ➢ Interstate water availability	SWRPD based on information from concerned department (WRD).

S. No	Issues	Data / Information Required	Responsibility
4.	Maintenance & monitoring	➢ Status of the Dam ➢ Status of the Main Canal ➢ Seepage in Dam/ Canal ➢ Weed growth in Canal ➢ Water logged Area ➢ Salinity Affected Area	SWRPD based on information from concerned department (WRD).
5.	Policy issues	➢ Formulate policies related to water sector ➢ Dissemination of information to the public on policy issues	SWRPD
6.	Awareness on good practices	➢ Water conservation ➢ Rain water harvesting ➢ Integrated Pest Management ➢ Participatory Irrigation management	SWRPD,

WRD (Irrigation Department) shall provide related data to SWRPD in the following manner to complete above table 6.1.

A sample **Questionnaire for Environmental Screening of a Dam (Annexure 6.1)** with a list of possible environmental and social aspects of a dam and a sample format for **Environmental Management Plan (EMP)** is placed **(Annexure 6.2)**. This is included to facilitate the department for clearer understanding of the formats to be used for submitting the information on ongoing works and to bring in practice for new works.

Two illustrative case studies of Morel and Jawai Dam in the state of Rajasthan have been included and information has been filled up in these formats **(Annexure 6.3 to 6.4)**. This gives a clear picture on how environmental aspects are mainstreamed in dam construction and are monitored for mitigation and enhancement in practice. This also allows WRD to understand the filling up of data in Annexure 6.1 & 6.2.

Action by WRD (Irrigation Department):

- SWRPD will seek data / information from WRD (Irrigation Department) in the above stated formats (Annex 6.1 & 6.2) to be filled up and return for on going and completed works.
- The irrigation department will also use these formats for all their new works of dam construction and submit data to SWRPD.

- In addition to above data on dams, regular data on quarterly basis shall also be supplied by WRD in the format at Annex 6.5.

(ii) Environmental Management of issues based on information from other Departments:

The information required for planning of water management strategies require input from various department on quality and quantity aspects is given in the table below with the related department.

SWRPD shall seek district wise environmental data, prepare , and publish as per Table 6.2 below based on formats developed for each stakeholder department in the annexure **6.6 to 6.11** as per detail below:

(a) Agriculture Department, -Annex -6.6
(b) Public Health Engineering Department (PHE) – Annex 6.7

(c) Ground Water Department (GWD)- Annex 6.8

(d) State Forest Department -Annexure-6.9

(e) Command Area Development (CAD)– Annex 6.10

(f) State Pollution Control Board (PCB) –Annex-6.11

Table 14: Proposed Action Plan of Integrated Planning for SWRPD based on information from concerned departments

S. No	Issues	Data / Information Required	Concerned Department
En 1.	Deterioration of Water Quality	Water Quality data on Surface and Groundwater may be monitored basin wise /district wise. ➢ pH, Electrical conductivity (EC), Chloride (Cl), Fluoride (F), Iron (Fe), Sodium(Na), Calcium(Ca), Silica(SiO_2) ➢ Nitrogen (N), Phosphorous (P), Potassium(K) ➢ Biological Contamination ➢ Pesticides ➢ Heavy metals	Based on information/ data as per formats from PHED, GWD and SPCB
2.	Ground Water Depletion	➢ Ground water availability ➢ Ground water extraction ➢ Ground water level ➢ Change in water level	Based on information/ data as per formats from GWD

S. No	Issues	Data / Information Required	Concerned Department
3.	Drinking Water Supply	➢ Source of drinking water – supply, canal, tubewell, well ➢ Area covered with water supply schemes in a basin / district	Based on information/ data as per formats from PHED
4.	Health Problem	➢ Water Quality Data - Nitrate, Fluoride, Faecal coliform ➢ Water related cases in public health centre and dispensaries ➢ Sanitation Data – No. of latrines in use, sanitation coverage.	Based on information/ data as per formats from PHED / PHC / PRI
5.	Catchment Degradation	➢ Forest cover in catchment ➢ Catchment Area Treatment Plan ➢ No. of plants planted, Species planted, Plantation area, Survival rate ➢ Construction work in catchment area of dam - road, industries, settlement, interception structures, etc ➢ Watershed development programs	Based on information/ data as per formats from Forest Dept., Soil Conservation,
6.	Land Degradation Command / Down stream	➢ Water logged area ➢ Irrigation schedule ➢ Status of main canal/ distributaries / field channels - lined or unlined ➢ Area affected by salinity ➢ Cropping pattern before,	Based on information/ data as per formats from CAD, WRD. AD
7.	Biodiversity loss	➢ Inventory and mapping of wetlands and protected areas in a basin – Area, ➢ Important species of flora and fauna ➢ Fish species	Based on information/ data as per formats from Forest Dept., Fishery Deptt.
8.	Awareness on good practices	➢ Water conservation ➢ Rain water harvesting ➢ Integrated Pest Management	SWRPD, WRD, Environment Dept.

S. No	Issues	Data / Information Required	Concerned Department
		➢ Participatory Irrigation management	

Note: AD – Agriculture Department, CAD – Command Area Development,
GWD - Ground Water Department, PHC – Public Health Centre,
PHED - Public Health Engineering Department, PRI - Panchayati Raj Institute,
SPCB - State Pollution Control Board, WRD-Water Resource Department

The data / information shall be collected , prepared and monitored periodically by the concerned dept and desired information as per requisite formats **(Annex 6.6 to 6.11)** sent by SWRPD to respective departments be provided to SWRPD on quarterly basis by such departments.

As per this action plan SWRPD shall prepare and publish on web site Quarterly Report and one Annual report on regular basis. **Format for developing this report are presented in Annexure 6.12.**

7. OUT PUT REQUIRED FOR SWRPD AS PER ENVIRONMENTAL MANAGEMENT GUIDELINES AND ACTION PLAN:

The following reports shall be an out put of Environmental Management guidelines and Action plan :

1. Regular collection of data as per formats provided in the Annexure for different Departments (Annexure 6.1,6.2, 6.5 to 6.11)
2. Quarterly preparation and publication of Environmental Management Reports as per Table 6.1and 6.2.
3. Annual Publication of Report as per sample format described in the guidelines at Annexure 6.12.

8. PROGRESS EVALUATION AND WAY FORWARD:

Every Department shall designate a nodal officer for data sharing. SWRPD shall conduct regular meetings of related departments and nodal officers at least twice a year to update information and to analyse bottlenecks in data collection and compilation so as to facilitate the publishing of data at web site and an annual report. SE (Environment), SWRPD shall be coordinator for conducting meetings and publishing report and data on website.

FORMATS FOR WRD (IRRIGATION DEPARTMENT)

ANNEXURE- 6.1

QUESTIONNAIRE OF ENVIRONMENTAL SCREENING OF DAM

Name of the Dam: _____

Village/Block/Tehshil/District _____

The feeder stream / basin: _____

Maintaining authority: _____

	Question / parameters	Answers / measurement
	PHYSICAL ENVIRONMENT	
A)	**Climate**	
1.	Provide salient features of climate of the region based on recent observation data such as average normal rainfall, mean maximum and minimum temperature, humidity, predominant wind direction and mean wind velocity etc.	
2.	Provide salient features of climate of the region based on Detailed Project Report of Dam (mention period).	
3.	During last ten years, maximum and minimum rainfall recorded in a year.	
4.	Recent highest recorded rainfall in a day at dam site/catchment area.	
5.	During last ten years, how many times actual rainfall reached/ exceeded average normal rainfall.	
6.	Does rainfall pattern show great variations, unequal seasonal distribution and frequent departures from the normal?	
7.	At how many locations in catchment /reservoir area, rain gauges and its type maintained by dam authority.	
8.	Nearest Meteorological/Rainfall observation Stations and its distance from dam site	
9.	How frequent the over rainfall in the area causes flood in surroundings?	
10.	Whether the dam site identified with potential of solar and wind energy development.	
11.	How frequent flash flood in the catchment	

	prompts dam release?					
12.	Is there any recent occurrence of cloud burst?					
13.	How frequent emergency dam release is done due to sudden water inflow?					
B)	**Topography/Geological settings of the region**					
14.	What is general topography of the area?	Hilly	Plateau	Plain	Valley	
15.	What is the general topography along reservoir periphery?	Surrounded by hills		Surrounded by almost plain area.		
16.	What are major underlying/outcrop rock types of the area?					
17.	Is surrounding area along reservoir landslide prone zone? If yes, whether any major landslide occurred in the past.					
18.	Is there any major geological fault zone?					
19.	Under which seismic zone does it fall?	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
20.	Major earthquake of the region and its year of occurrence and intensity at Richter Scale					
C)	**Ambient Air Quality**					
21.	Is there any area source/point source of air pollution in the immediate vicinity of dam location? If yes, provide some details.					
22.	Is there any odour/nuisance smell prevailing near dam site.					
23.	High/low traffic intensity in dam vicinity					
D)	**Water Quality Status of River and Reservoir**					
24.	Is water quality of reservoir being monitored and if yes, by whom and with what frequency.					
25.	Is reservoir water being used for drinking purpose and if yes, period of water withdrawal from reservoir.					
26.	Is reservoir water quality changing?	No	Improving	Deteriorating		
27.	If deteriorating, what are critical parameters?					
28.	Is there any known anthropogenic sources/activities in catchment such as industrial pockets/mining activities which causes deterioration of reservoir water quality?					
29.	Is reservoir water quality showing any visible sign for infesting with aquatic weeds?					
30.	Is ground water in dam and reservoir vicinity contaminated with nitrate /fluoride /arsenic /salinity /any other?					

31.	Is there any known source of water pollution such as outfall of sewer, industry effluent, drainage etc. along the reservoir rim?				
32.	Major industrial projects located in the catchment area/ dam vicinity	No industry	Water polluting	Non-water polluting	
E)	**Hydrology (Surface and Ground Water)**				
33.	Name of basin and sub basin of dam				
34.	Basin area and name of main river and its tributaries				
35.	Name and type of influent river to dam				
36.	Nature of inlet river course in dam vicinity	1) Alluvium plain with frequently altering the course			
		2)Rocky area with firm bank and slope			
		3) Ravine and gully Land			
		3) Others (mention)			
37.	No of times reservoir filled to its capacity during last 10 years	Less than 50%	Between 50% and 100 %	Full Capacity	
38.	No of times reservoir utilized its full live storage water before pre monsoon during last 10 years				
39.	Long term ground water fluctuation trend in dam vicinity particularly along d/s river stretch villages.	Positive	Declining	Rapidly Declining	
F)	**Soil Condition**				
40.	What is the major soil type of the region (Laterite, Alluvial, Black cotton, Forest, Desert, saline-sodic etc)?				
41.	Soil texture in immediate d/s dam vicinity and along reservoir rim (Clay, silt clay, sandy clay, sand, silt etc)				
42.	Erodibility Class of soil along d/s river stretch	Negligible	Low	Moderate	High	Very High
43.	Erodibility Class of soil in catchment and along u/s river stretch	Negligible	Low	Moderate	High	Very High
44.	Erodibility Class of soil along reservoir rim	Negligible	Low	Moderate	High	Very High
G)	**Land Use**				
45.	Predominant land use of catchment	Agriculture	Dense Forest	Degraded Forest	Built up area
46.	Predominant land use along reservoir rim	Hillock with plantation	Barren hillock	Agriculture	Plantation
47.	Predominant land use on dam toe land excluding river bed and canal outlet	Barren	Agriculture	Built up	Forest

48.	Provide major land use pattern of district having maximum portion of catchment				
49.	Comment on land use pattern change of catchment and along d/s river stretch (Old DPR may be referred)				
H)	**Command Area**				
50.	Total Culturable command Area				
51.	Districts / Tehsils involved				
52.	No. of villages benefited				
53.	WUA formed or not. If yes, how many				
54.	Predominant land use of command area	Agriculture	Dense Forest	Degraded Forest	Built up area
55.	Soil type of command area	Loam soil			
56.	Problems in command Area	**a.** Salinity b. Sodicity c. Soil Erosion **d.** Fluoride e. Nitrate			
57.	Major crops of command area	Wheat, Mustard, Castor			
58.	Period of operation of canal	26 Days			

Format for Biological Environment							
1.	What is major vegetation type of the area?	.					
2.	Is there any natural forest nearby?	No	Yes	<500mts	Type		
				< 1km	Type		
				< 5kms	Type		
				< 10kms	Type		
3.	Forest Area in district having large share of catchment. (Source: SFR)	Very dense	Moderately Change	Open forest	Total Forest	Change from year--	
4.	Is there any area of plantation or greenbelt development?	No	Yes	<100mts	Type		
				<500mts	Type		
				< 1km	Type		
				< 5kms	Type		
5.	Is there any protected area near dam?	No	Yes	Type	Distance		
				National Park			
				Sanctuary			
				Reserve forest			
				Protected forest			
				Biosphere reserve			
				Tiger reserve			
				Elephant reserve			
6.	Is there any reported alien floral species?	No	Yes	Give list			
7.	Is there any reported alien faunal species?	√No	Yes	Give list			
8.	Is there any Rare or endangered flora?	No	Yes	Give list			
9.	Is there any Rare or endangered fauna?	No	Yes	Give list			
10.	Whether the reservoir is a preferred wetland for the waterfowls?	√ No					
11.	Does the reservoir host important fish species?	No	Yes	.			
12.	Is there any endangered aquatic fauna present in the reservoir?	No	Yes	Give list			
13.	Is there any important breeding ground of any animal species near reservoir vicinity?	No	Yes	Distance	Breeding Species		

Format for Social Features			
S. No.	**Parameters**	**District –Pali**	**Tehsil – Bali**
1	**Population**		
	Urban Population		
	Rural Population		
	SC Population (%)		
	ST Population (%)		
	Sex Ratio		
2	**Literacy Rate**		
	Male Literacy		
	Female Literacy		
3	**Work Participation Rate**		
4.	**Main Occupation**		
5	**Industries (name)**		
6	**Nearest/ Important Urban Centers/ Towns**		
7	**Electrification of Villages**		
8	**Language spoken**		
9	**Religion Practiced**		
10	**Festivals and Fairs**		
11	**Cultural / Historical Site**		
12	**Settlement / Villages likely to be affected from the release of water**	.	
13	**Landuse around the Dam**	Within 500m	
		Within 1km	
		Within 2km	
14	**Occupation of people in the vicinity of Dam**	Within 500m	
		Within 1km	
		Within 2km	
15	**Is there any tribal population in the vicinity of Dam**	Within 500m	
		Within 1 km	
		Within 2km	

ANNEXURE-6.2

Format for Environmental Management Plan

Issues	Mitigation Measures	Implementing Agency	Supervision

ANNEXURE -6.3

Jawai Dam – Case Study

Name of the dam: Jawai Dam
Village: Bhinga
Town : Sumerpur
Tehshil / District /: Bali / Pali
The feeder Stream : Jawai River
Basin: Luni Basin
Maintaining Authority: Irrigation Department, Rajasthan

Baseline Environmental Status of Jawai Dam

	Question / parameters	Answers / measurement
	PHYSICAL ENVIRONMENT	
A)	**Climate**	
1.	Provide salient features of climate of the region based on recent observation data such as average normal rainfall, mean maximum and minimum temperature, humidity, predominant wind direction and mean wind velocity etc.	The climate of the area is very dry with extreme temperature and low rainfall. Average maximum and minimum temperatures recorded are 41 °C and 10 °C respectively. The average annual rainfall received is 49 cm. Relative humidity varies from 35-56% in summers and 51-76% in winters.
2.	Provide salient features of climate of the region based on Detailed Project Report of Dam (mention period).	Not Available
3.	During last ten years, maximum and minimum rainfall recorded in a year.	Max rainfall 754.3 mm (2003) Minimum rainfall 178.7 mm (2002)
4.	Recent highest recorded rainfall in a day at dam site/catchment area.	160 mm (11 July 2001)
5.	During last ten years, how many times actual rainfall reached/ exceeded average normal rainfall.	Three times (2003, 2001, 1997)
6.	Does rainfall pattern show great variations, unequal seasonal distribution and frequent departures from the normal?	No
7.	At how many locations in catchment /reservoir area, rain gauges and its type maintained by dam authority.	Two –Bhatundi river & Bera river
8.	Nearest Meteorological/Rainfall observation Stations and its distance from dam site	On dam itself
9.	How frequent the over rainfall in the area causes flood in surroundings?	Average in a Decade
10.	Whether the dam site identified with potential of solar and wind energy development.	No
11.	How frequent flash flood in the catchment prompts dam release?	Since 1956 the Dam has overflown four times

	Question / parameters	Answers / measurement				
12.	Is there any recent occurrence of cloud burst?	No				
13.	How frequent emergency dam release is done due to sudden water inflow?	Rarely				
B)	**Topography/Geological settings of the region**					
14.	What is general topography of the area?	√ **Hilly**	Plateau	Plain	Valley	
15.	What is the general topography along reservoir periphery?	**Surrounded by hills -** √		Surrounded by almost plain area.		
16.	What are major underlying/outcrop rock types of the area?	Limestone, Phyllite, schist and granite				
17.	Is surrounding area along reservoir landslide prone zone? If yes, whether any major landslide occurred in the past.	No				
18.	Is there any major geological fault zone?	No				
19.	Under which seismic zone does it fall?	Zone 1	√ **Zone 2**	Zone 3	Zone 4	Zone 5
20.	Major earthquake of the region and its year of occurrence and intensity at Richter Scale	NA				
C)	**Ambient Air Quality**					
21.	Is there any area source/point source of air pollution in the immediate vicinity of dam location? If yes, provide some details.	No				
22.	Is there any odour/nuisance smell prevailing near dam site.	No				
23.	High/low traffic intensity in dam vicinity	Very Low				
D)	**Water Quality Status of River and Reservoir**					
24.	Is water quality of reservoir being monitored and if yes, by whom and with what frequency.	Yes, PHED				
25.	Is reservoir water being used for drinking purpose and if yes, period of water withdrawal from reservoir.	Yes, as per availability				
26.	Is reservoir water quality changing?	√ No	Improving	Deteriorating		
27.	If deteriorating, what are critical parameters?	NA				
28.	Is there any known anthropogenic sources/activities in catchment such as industrial pockets/mining activities which causes deterioration of reservoir water quality?	No				
29.	Is reservoir water quality showing any visible sign for infesting with aquatic weeds?	No				
30.	Is ground water in dam and reservoir vicinity contaminated with nitrate /fluoride /arsenic	Fluoride in GW of Command & Downstream area.				

	Question / parameters	Answers / measurement				
	/salinity /any other?					
31.	Is there any known source of water pollution such as outfall of sewer, industry effluent, drainage etc. along the reservoir rim?	No				
32.	Major industrial projects located in the catchment area/ dam vicinity	√ No industry	Water polluting	Non-water polluting		
E)	**Hydrology (Surface and Ground Water)**					
33.	Name of basin and sub basin of dam	Luni Basin, Jawai Sub-basin				
34.	Basin area and name of main river and its tributaries	Basin Area 37,363 km^2 Luni river and tributaries are Sukri, Mithri, Bandi, Khari, Jawai, Guhiya and Sagi on the left and Jojari on the right.				
35.	Name and type of influent river to dam	Jawai river, ephemeral				
36.	Nature of inlet river course in dam vicinity	1) Alluvium plain with frequently altering the course				
		2)Rocky area with firm bank and slope √				
		3) Ravine and gully Land				
		3) Others (mention)				
37.	No of times reservoir filled to its capacity during last 10 years	√ Less than 50%	Between 50% and 100 %	Full Capacity		
38.	No of times reservoir utilized its full live storage water before pre monsoon during last 10 years	One time in 1994 (1994- 2004)				
39.	Long term ground water fluctuation trend in dam vicinity particularly along d/s river stretch villages.	Positive	√ Declining	Rapidly Declining		
F)	**Soil Condition**					
40.	What is the major soil type of the region (Laterite, Alluvial, Black cotton, Forest, Desert, saline-sodic etc)?	Alluvial				
41.	Soil texture in immediate d/s dam vicinity and along reservoir rim (Clay, silt clay, sandy clay, sand, silt etc)	Loam				
42.	Erodibility Class of soil along d/s river stretch	Negligible	Low √	Moderate	High	Very High
43.	Erodibility Class of soil in catchment and along u/s river stretch	Negligible	Low	Moderate √	High	Very High
44.	Erodibility Class of soil along reservoir rim	Negligible	Low	Moderate √	High	Very High
G)	**Land Use**					
45.	Predominant land use of catchment	Agriculture	Dense Forest	Degraded Forest √	Built up area	

	Question / parameters	Answers / measurement			
46.	Predominant land use along reservoir rim	Hillock with plantation	√ Barren hillock	Agriculture	Plantation
47.	Predominant land use on dam toe land excluding river bed and canal outlet	√ Barren	Agriculture	Built up	Forest
48.	Provide major land use pattern of district having maximum portion of catchment	Net sown area (46.60%), Forest land (6.48%), Fallow land (19.10%), Permanent pasture and other grazing land (7.35%), Other uncultivated land (3.87%)			
49.	Comment on land use pattern change of catchment and along d/s river stretch (Old DPR may be referred)	Dense forest converting into open forest in Catchment area.			
H)	**Command Area**				
50.	Total Culturable command Area	1.026 lakh hectares			
51.	Districts / Tehsils involved	Pali / Sumerpur			
52.	No. of villages benefited	33 villages in Pali district and 24 villages in Jalore district.			
53.	WUA formed or not. If yes, how many	11			
54.	Predominant land use of command area	Agriculture √	Dense Forest	Degraded Forest	Built up area
55.	Soil type of command area	Loam soil			
56.	Problems in command Area	**f.** Salinity **-** √ g. Sodicity h. Soil Erosion **i.** Fluoride - √ j. Nitrate			
57.	Major crops of command area	Wheat, Mustard, Castor			
58.	Period of operation of canal	26 Days			

Format for Biological Environment							
1.	What is major vegetation type of the area?	*Butea monosperma, Prosopis juliflora, Acacia senegal, Calotropis procera, Euphorbia* etc.					
2.	Is there any natural forest nearby?	√No	Yes	<500mts	Type		
				< 1km	Type		
				< 5kms	Type		
				< 10kms	Type		
3.	Forest Area in district having large share of catchment. (Source: SFR)	Very dense	Moderately Change	√Open forest	Total Forest	Change from year--	
4.	Is there any area of plantation or greenbelt development?	√ No	Yes	<100mts	Type		
				<500mts	Type		
				< 1km	Type		
				< 5kms	Type		
5.	Is there any protected area near dam?	√ No	Yes	Type	Distance		
				National Park			
				Sanctuary			
				Reserve forest			
				Protected forest			
				Biosphere reserve			
				Tiger reserve			
				Elephant reserve			
6.	Is there any reported alien floral species?	√ No	Yes	Give list			
7.	Is there any reported alien faunal species?	√ No	Yes	Give list			
8.	Is there any Rare or endangered flora?	√ No	Yes	Give list			
9.	Is there any Rare or endangered fauna?	√ No	Yes	Give list			
10.	Whether the reservoir is a preferred wetland for the waterfowls?	√ No					
11.	Does the reservoir host important fish species?	No	Yes	Rohu, Katla etc.			
12.	Is there any endangered aquatic fauna present in the reservoir?	√ No	Yes	Give list			
13.	Is there any important breeding ground of any animal species near reservoir vicinity?	√ No	Yes	Distance	Breeding Species		

Format for Social Features			
S. No.	**Parameters**	**District –Pali**	**Tehsil – Bali**
1	**Population**		
	Urban Population	391	39225
	Rural Population	1429	183802
	SC Population (%)	17.76	16.8
	ST Population (%)	5.81	22.6
	Sex Ratio	983	999
2	**Literacy Rate**		
	Male Literacy	73.06	64.4
	Female Literacy	36.70	35.6
3	**Work Participation Rate**	39.8	39.8
4.	**Main Occupation**	Agriculture, Labourers etc. But majority are non-workers.	
5	**Industries (name)**	ACSR conductors, Agricultural equipments, Conduit pipes. Cement, guar gum, pesticides, textile dyeing and printing etc.	
6	**Nearest/ Important Urban Centers/ Towns**	There are 6 towns in the district, Bali and Sumerpur & Shivganj being the nearest.	
7	**Electrification of Villages**	All the 904 villages in the district are electrified.	
8	**Language spoken**	Marwari, Khariboli, etc.	
9	**Religion Practiced**	Hinduism, Islam, Jainism	
10	**Festivals and Fairs**	Fairs are held at several places of the district. The major festivals are Sheela Ashtmi, Rakhi, Janmashtami, Navratri, Deepawali, Holi, Teej, Muharram and Id.	
11	**Cultural / Historical Site**	Sojat (Fort and Temples), Ranakpur (Jain Temple), Ghanerao (Hindu and Jain Temples), Bali (Fort and Parasnathji's temple) etc.	
12	**Settlement / Villages likely to be affected from the release of water**	Lakma, Novi , Chota lama and Madev.	
13	**Landuse around the Dam**	Within 500m	
		Within 1km	Agriculture
		Within 2km	
14	**Occupation of people in the vicinity of Dam**	Within 500m	-
		Within 1km	Agriculture

		Within 2km	Agriculture
15	**Is there any tribal population in the vicinity of Dam**	Within 500m	No
		Within 1 km	No
		Within 2km	-

Environmental Management Plan Catchment Area – Jawai Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Catchment Area Plan	➢ Catchment development plan may be formulated	Forest Dept	Water Resources Dept
Siltation	➢ Watershed development schemes & Afforestation programs may be taken in the area to check siltation	Forest Dept Watershed Dept.	Water Resources Dept
Lack of Monitoring Station (River Discharge Rainfall)	➢ Monitoring station required for river discharge and rainfall measurement ➢ Adequate no. of rain gauges may be installed	Water Resource Dept	Water Resources Dept
Dam Inspection Road	➢ Dam Inspection road may developed ➢ The Dam access road may be maintained	PWD	Water Resources Dept

Environmental Management Plan - Reservoir and Vicinity of Jawai Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Leakage & Seepage	➢ Leakage of water was observed near the spill gates may be checked	Water Resource Dept	Water Resources Dept
Maintenance of Records	➢ Computer facility may be used for data management.	Dam Authority	Water Resources Dept
Maintenance of Dam Structures	➢ Structures which old like fence and rotten iron may be replaced/ painted ➢ Dam Safety Network may be strengthened	Dam Authority	Water Resources Dept
Fishery Development	➢ Fishery activity may be encouraged and local inhabitants may be also provided fishing rights	Fishery Dept	Water Resources Dept
Beautification of Adjacent Area	➢ The land adjacent to the dam may be developed as picnic spot ➢ Plantation may be carried in the area ➢ Garden adjacent to dam may be maintained and drinking water and refreshment facility may be developed ➢ The site has scope for eco-tourism which can be developed in consultation with Tourism Dept.	Tourism Dept Dam Authority	Water Resources Dept

Environmental Management Plan – Command Area of Jawai Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Water Distribution	➢ The water distribution in command area may be regularised. Equitable allocation of irrigation water is required so that tailend farmers are also benefited. ➢ Water charges may be collected on Quantity basis	WUA Agriculture Dept	Water Resources Dept
Maintenance of Canal	➢ Lining of main, minor and watercourses may be done on priority basis ➢ Aquatic weeds along the canals may be removed periodically ➢ Fencing may be provided along main canal near habitation	Irrigation Dept	Water Resources Dept
Drinking Water Supply	➢ The water used for drinking (wells) is fluoride affected, drinking water may be supplied from the dam.	PHED	Water Resources Dept
Empowerment of WUA	➢ The WUA may be strengthened and handed over the scheme in command area as per the PIM Act 2000	Water Resources Dept	Water Resources Dept

Environmental Management Plan – Downstream of Jawai Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Water for irrigation	➢ The farmers are totally depended on GW for irrigation which has affected the crop of the D/S. Some water may be released downstream	Water Resources Dept	Water Resources Dept
Ground Water	➢ GW level has shown alarming trend, GW recharge schemes/ alternative source required in the area.	PHED District Collectorate	Water Resources Dept
Flood	➢ Flood Management Plan may be developed ➢ There are four villages Lakma, Novi, Chotta Lama and Madev prone to flooding	Dam Safety Organization/ Dam Level Authority	Water Resources Dept
Warning System	➢ Warning System may be strengthened with strong communication network ➢ Young Squad may be formed in villages to help during emergency ➢ First Aid and Medical facilities may be developed in the village	District Collectorate Health Dept Village Panchayat	Water Resources Dept

Issues	Mitigation Measures	Implementing Agency	Supervision
Socio-economic Status	➢ Socio-economic status have been adversely affected due to irrigation expenses and less crop yield ➢ Income Generating Activity may be promoted in the area	District Collectorate	Water Resources Dept

ANNEXURE-6.4

Morel Dam – Case Study

Name of the dam: Morel Dam
Village: Bagdi
Block/Tehsil : Lalsot
District/State: Dausa/ Rajasthan
Feeder stream: Morel River
Basin: Banas Basin
Maintaining Authority : Irrigation Department of Rajasthan

Baseline Environmental Status of Morel Dam

	Question / parameters	Answers / measurement
	PHYSICAL ENVIRONMENT	
A)	**Climate**	
1.	Provide salient features of climate of the region based on recent observation data such as average normal rainfall, mean maximum and minimum temperature, humidity, predominant wind direction and mean wind velocity etc.	The climate is dry and is subjected to extremeness of cold and heat. The minimum and maximum temperatures recorded are 3.33º C and 44º C respectively. The normal annual rainfall is 55.2cm and rainy season lasts from June to September.
2.	Provide salient features of climate of the region based on Detailed Project Report of Dam (mention period).	The area has a dry climate except during rainy season. From December to February the season is cool and dry. The hot season is from March to about the third week of June. The rainy season which follows lasts till about the third week of September. The mean daily maximum temperature in June is about 40.6º C and mean daily minimum is 27.3º C in the summers. The relative humidity is generally over 60% during the south west monsoon season. During the rest of the year the air is dry. Winds are generally high to moderate with some strengthening in force in the summer and early southeast monsoon season. Average rainfall of the catchment area was taken as 19.7" (1979-80)
3.	During last ten years, maximum and minimum rainfall recorded in a year.	1998 – 34.8 cm 2000 – 899.2 cm
4.	Recent highest recorded rainfall in a day at dam site/catchment area.	Not Available
5.	During last ten years, how many times actual rainfall reached/ exceeded average normal rainfall.	4 times
6.	Does rainfall pattern show great variations, unequal seasonal distribution and frequent departures from the normal?	Not Available
7.	At how many locations in catchment /reservoir area, rain gauges and its type maintained by dam authority.	1 rainguage station at dam, none in the upstream.

	Question / parameters	Answers / measurement				
8.	Nearest Meteorological/Rainfall observation Stations and its distance from dam site	On dam				
9.	How frequent the over rainfall in the area causes flood in surroundings?	Infrequent, last in 1986				
10.	Whether the dam site identified with potential of solar and wind energy development.	No				
11.	How frequent flash flood in the catchment prompts dam release?	No				
12.	Is there any recent occurrence of cloud burst?	No				
13.	How frequent emergency dam release is done due to sudden water inflow?	No				
B)	**Topography/Geological settings of the region**					
14.	What is general topography of the area?	Hilly	Plateau	√ Plain	Valley	
15.	What is the general topography along reservoir periphery?	Surrounded by steep hills		√-Surrounded by almost plain area		
16.	What are major underlying/outcrop rock types of the area?	Alluvium and Aeolian Sand				
17.	Is surrounding area along reservoir landslide prone zone? If yes, whether any major landslide occurred in the past.	No				
18.	Is there any major geological fault zone?	No				
19.	Under which seismic zone does it fall?	Zone 1	Zone 2	√ Zone 3	Zone 4	Zone 5
20.	Major earthquake of the region and its year of occurrence and intensity at Richter Scale	No seismic activity reported in the area				
C)	**Ambient Air Quality**					
21.	Is there any area source/point source of air pollution in the immediate vicinity of dam location? If yes, provide some details.	No				
22.	Is there any odour/nuisance smell prevailing near dam site.	No				
23.	High/low traffic intensity in dam vicinity	Low				
D)	**Water Quality Status of River and Reservoir**					
24.	Is water quality of reservoir being monitored and if yes, by whom and with what frequency.	No				
25.	Is reservoir water being used for drinking purpose and if yes, period of water withdrawal from reservoir.	When water is available				
26.	Is reservoir water quality changing?	No - √	Improving	Deteriorating		

	Question / parameters	Answers / measurement		
27.	If deteriorating, what are critical parameters?	NA		
28.	Is there any known anthropogenic sources/activities in catchment such as industrial pockets/mining activities which causes deterioration of reservoir water quality?	NA		
29.	Is reservoir water quality showing any visible sign for infesting with aquatic weeds?	No		
30.	Is ground water in dam and reservoir vicinity contaminated with nitrate/fluoride/arsenic/salinity/any other?	Salinity/ Fluoride/ Nitrate		
31.	Is there any known source of water pollution such as outfall of sewer, industry effluent, drainage etc. along the reservoir rim?	No		
32.	Major industrial projects located in the catchment area/dam vicinity	No industry √	Water polluting	Non-water polluting
E)	**Hydrology (Surface and Ground Water)**			
33.	Name of basin of dam	Banas basin		
34.	Sub basin area and name of main river and its tributaries	Catchment area of Banas sub-basin is 45833 km^2. Main tributaries of Banas are Berach and Menali on the right, and Kothari, Khari, Dai, Dheel, Sohadara, Morel and Khalisil on the left.		
35.	Name and type of influent river to dam	Morel, Ephemeral		
36.	Origin of the river, total length and length up to sub-project dam site	Kukus hills range of Jaipur, 100 miles		
37.	Nature of inlet river course in dam vicinity	1) Alluvium plain with frequently altering the course **-** √		
		2)Rocky area with firm bank and slope		
		3) Ravine and gully Land		
		3) Others (mention)		
38.	Distance of u/s and d/s confluence point with influent river from dam	Not Available		
39.	Distance of any dam located on u/s and d/s side on influent river from sub-project dam	Not Available		
40.	Average annual yield of river at dam site(at 50% or 75 % dependability)	Not Available		
41.	Period of lean season flow in u/s and d/s of river near dam vicinity	Not Available		
42.	Location of river gauge station in u/s stretch of river	Not Available		
43.	No of times reservoir filled to its capacity during last 10 years	Less than 50**%** **-** √	Between 50% and 100 %	Full Capacity

	Question / parameters	Answers / measurement				
44.	No of times reservoir utilized its full live storage water before pre monsoon during last 10 years	Not Available				
45.	Whether development of ground water in block where reservoir located, exceeded 100 % or having potential for its further utilization.	Overexploited GW				
46.	Is reservoir block categorized as critical or semi critical group from ground water development point of view?	Overexploited				
47.	Long term ground water fluctuation trend in dam vicinity particularly along d/s river stretch villages.	Positive	Declining	Rapidly Declining		
F)	**Soil Condition**					
48.	What is the major soil type of the region (Laterite, Alluvial, Black cotton, Forest, Desert, saline-sodic etc)?	Alluvial, Black cotton				
49.	Soil texture in immediate d/s dam vicinity and along reservoir rim (Clay, silt clay, sandy clay, sand, silt etc)	Sandy clay loam to sandy loam				
50.	Erodibility Class of soil along d/s river stretch	Negligible	Low	Moderate	High	Very High
51.	Erodibility Class of soil in catchment and along u/s river stretch	Negligible	Low	Moderate	High	Very High
52.	Erodibility Class of soil along reservoir rim	Negligible	Low	Moderate	High	Very High
53.	Soil Profile along reservoir rim and immediate d/s of dam	Deep (50-100 cm)	Moderately Deep (25-50 cm)	Shallow (10-25 cm)	Very Shallow (less than 10 cm)	
G)	**Land Use**					
54.	Predominant land use of catchment	Agriculture - √	Dense Forest	Degraded Forest	Built up area	
55.	Predominant land use along reservoir rim	Hillock with plantation	Barren √	Agriculture	Plantation	
56.	Predominant land use on dam toe land excluding river bed and canal outlet	Barren	Agriculture √	Built up	Forest	
57.	Provide major land use pattern of district having maximum portion of catchment	Net sown area (%), Forest land (%), Fallow land (%), Permanent pasture and other grazing land, Other uncultivated land (%)				
H)	**Command Area**					
58.	Total culturalable command area	19393 ha				
59.	Districts / tehsils involved	Sawai Madhopur & Dausa /				
60.	No. of villages benefitted	45 + 17 bed cultivation				

	Question / parameters	Answers / measurement			
61.	WUA formed or not. If yes, how many	7 WUA (Dausa Sub-division)			
62.	Predominant land use of command	Agriculture - √	Dense Forest	Degraded Forest	Built up area
63.	Soil Type of the command Area	Sandy clay loam to sandy loam			
64.	Problems in Command Area	➢ Salinity - √ ➢ Sodicity ➢ Soil erosion - ➢ Fluoride - √ ➢ Nitrate -			
65.	Major Crops of the area	Mustard, wheat			
66.	Schedule of Water Release (yearly)	After 1981, very few times the dam has filled up, hence no fixed schedule. If given, then in Kharif season.			
67.	Period of operation of canal				

Format for Biological Environment						
1.	What is major vegetation type of the area?	Scrub land with agricultural fields. The common noted species are *Acacia nilotica, A. Senegal, Prosopis, Anogeissus, Calotropis*, *Euphorbia*, *Albizzia* etc.				
2.	Is there any natural forest nearby?	**No** - √	Yes	<500mts	Type	
				< 1km	Type	
				< 5kms	Type	
				< 10kms	Type	
3.	Forest Area in Jaipur district having large share of catchment (Source: State of Forest Report 2005)	Very dense 0 km^2	Moderately Change 113 km^2	Open forest 510 km^2	Total Forest 623 km^2	Change from year 2003 2 km^2
4.	Is there any area of plantation or greenbelt development?	No - √	Yes	<100mts	Type	
				<500mts	Type	
				< 1km	Type	
				< 5kms	Type	
5.	Is there any protected area near dam?	No - √	Yes	Type	Distance	
				National Park		
				Sanctuary		
				Reserve forest		
				Protected forest		
				Biosphere reserve		
				Tiger reserve		

				Elephant reserve	
6.	Is there any reported alien floral species?	No -√	Yes	Give list	
7.	Is there any reported alien faunal species?	No - √	Yes	Give list	
8.	Is there any Rare or endangered flora?	No - √	Yes	Give list	
9.	Is there any Rare or endangered fauna?	No- √	Yes	Give list	
10.	Whether the reservoir is a preferred wetland for the waterfowls?	No			
11.	Does the reservoir host important fish species?	No - √	Yes	Give list	
12.	Is there any endangered aquatic fauna present in the reservoir?	No - √	Yes	Give list	
13.	Is there any important breeding ground of any animal species near reservoir vicinity?	No - √	Yes	Distance	Breeding Species

Format for Social Features			
S. No.	**Parameters**	**District –Dausa**	**Tehsil – Lalsot**
1	**Population**		
	Urban Population	135818	28249
	Rural Population	1181245	251370
	SC Population (%)	21.21	20.2
	ST Population (%)	26.81	37.4
	Sex Ratio	899	917
2	**Literacy Rate**		
	Male Literacy (%)	79.35	70.4
	Female Literacy (%)	42.32	29.6
3	**Work Participation Rate** (%)	41.2	42
4.	**Main Occupation**	Agriculture, Processing servicing and repairs etc. But majority belong to non-worker category.	
5	**Industries (name)**	Electrical, Saw Mill, Oil Mills and Products, Sculpture and Pottery industry, Cottage industries etc.	
6	**Nearest/ Important Urban Centers/ Towns**	There are 5 towns in the district, Lalsot is the nearest	
7	**Electrification of Villages**	1052 villages have been electrified in Dausa district till 2003-04.	
8	**Language spoken**	Hindi, Sindhi	
9	**Religion Practiced**	Hinduism, Islam, Jainism and Sikhism	

10	**Festivals and Fairs**	Teej and Gangaur are celebrated as holding fairs. Common festivals are Janamashthami, Diwali, Holi, Dusshehra, Rakhi and Sheetla Asthami. Jains celebrate Mahavir Jayanti and muslims celebrate Id, Muharram etc.	
11	**Cultural / Historical Site**	Abaneri, Harshat Mata Temple, Jain Temples, Chand Baori, Balaji, etc.	
12	**Settlement / Villages likely to be affected from the release of water**	Matlana, Rajpura, Bijapura, Rugli, Bareri, Falvadia ki Dhandi, Dova, Mundayoo, Bagdi, Kherali, Khatwa, Bareykhan, Sunderpur	
13	**Landuse around the Dam**	Within 500m	Agriculture
		Within 1km	Agriculture
		Within 2km	Agriculture
14	**Occupation of people in the vicinity of Dam**	Within 500m	Agriculture and Labour
		Within 1km	Agriculture
		Within 2km	Agriculture
15	**Is there any tribal population in the vicinity of Dam**	Within 500m	Yes
		Within 1 km	Yes
		Within 2km	Yes

Environmental Management Plan Catchment Area- Morel Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Catchment Area Plan	➢ Catchment area development plan may be formulated.	Forest Dept	Water Resources Dept
Siltation	➢ Watershed development schemes & Afforestation programs may be taken in the area to check degradation ➢ Local participation can be explored in afforestation program	Forest Dept Watershed Dept.	Water Resources Dept
Construction activity	➢ Construction of anicuts, roads and dam in upstream of Morel dam may be reviewed with reference to its impact on the dam.	-	Water Resources Dept
Lack of Monitoring Station (River Discharge Rainfall)	➢ Monitoring station required for river discharge and rainfall measurement ➢ Adequate no. of rain gauges may be installed in the catchment area	Water Resource Dept	Water Resources Dept
Dam Inspection Road	➢ Dam Inspection road may developed ➢ The Dam access road may be maintained	PWD / Construction contractor	Water Resources Dept

Environmental Management Plan - Reservoir and Vicinity of Morel Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Maintenance of Records	➢ Computer facility may be used for data management. ➢ All records related to catchment, command and dam must be available at Dam site ➢ Index map, potential hazard zone, map, catchment and command location map may be updated with latest information. ➢ Co-ordination is required between Dam authority Dausa and Command division Sawai Madhopur	Water resources Dept.Dausa and Sawai Madhopur	Water Resources Dept
Maintenance of Dam Structures	➢ The Dam structure must be maintained and all trees on the structure may be removed with roots ➢ The up gradation of spillway may be taken up with higher authority. ➢ Dam Safety Network may be strengthen	Dam Authority	Water Resources Dept
Beautification of Adjacent Area	➢ The land adjacent to the dam may be developed. Most of the area is barren land ➢ Plantation may be carried in the area. Development of Horticulture plant can be encouraged in the area. ➢ The approach road may be maintained with proper signage, lighting and plantation.	Dam Authority	Water Resources Dept

Environmental Management Plan – Command Area of Morel Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Water Distribution	➢ The water distribution in command area may be regularized. Tailend farmers may be provided required water ➢ Water charges may be collected on Quantity basis ➢ WUA may be strengthened to take up water distribution in their hand	WUA Agriculture Dept	Water Resources Dept
Maintenance of Canal	➢ Lining of minor and watercourses may be done on priority basis	Irrigation Dept CAD	Water Resources Dept
Drinking Water Supply	➢ The Ground water used for drinking is fluoride affected, Potable water may be supplied to the affected areas. ➢ De-fluorization techniques may be utilized ➢ Awareness programs may be conducted to educate the masses on impact of fluoride	PHED	Water Resources Dept
Ground water Depletion	➢ Ground water harvesting program may be strictly implemented in the area. ➢ Withdrawal of GW for other than drinking purpose should not be permitted.	Ground Water Department	Water Resources Dept

Issues	Mitigation Measures	Implementing Agency	Supervision
Salinity	➢ Proper drainage system required in the catchment area ➢ Awareness program should be conducted to educate people on proper irrigation ➢ Rotation of crops may be encouraged.	Irrigation Dept CAD	Water Resources Dept
Empowerment of WUA	➢ The WUA may be strengthened and handed over the scheme in command area as per the PIM Act 2000	Water Resources Dept	Water Resources Dept

Environmental Management Plan – Downstream of Morel Dam

Issues	Mitigation Measures	Implementing Agency	Supervision
Flood	➢ Flood Management Plan may be developed ➢ Proper communication system should be established	Dam Safety Organization / Dam Level Authority	Water Resources Dept
Warning System	➢ Warning System may be strengthened with strong communication network ➢ Young squad may be formed in villages to help during emergency ➢ First Aid and Medical facilities may be developed in the village	District Collectorate Health Dept Village Panchayat	Water Resources Dept

ANNEXURE-6.5

Format for Water Resources Department

Extent of Various Types of Degraded Land

District	Water Erosion	Wind Erosion	Ravines	Soil Affected	Water Logging	Degraded Forests	Total

District-wise/ Basin-wise Area Sown and Irrigated Trend

Parameter	Previous Year	Current Year
Net Sown Area		
Gross Sown Area		
Net Irrigated Area		
Gross Irrigated Area		
Cropping Intensity (%)		
Irrigation Intensity (%)		

Catchment Statistics of basins in Rajasthan

Basins	Catch Area (sq km)	Length (km)	Shape	%States Sharing	Outflow/ Inflow	% Forest Coverage

Rajasthan/Basin wise Annual Fresh Water Withdrawals

S. No	Country/ Category	Annual Fresh Water Withdrawals (%)		
		Agriculture	Industry	Domestic

Irrigation Profile: Rajasthan and Basin-wise

S. No	Item	1985	2000	2006
1	**Rainfall (mm)**			
	Eastern Part			
	Western Part			
	Northern Part			
	Southern Part			
2	**Net Area Irrigated (lakh ha)**			
	Canals			
	Wells			
	Tank			
	Other Sources			
3	Gross Area Irrigated (lakh ha)			
4	Net Area Sown (lakh ha)			
5	Gross Cropped Area (lakh ha)			
6	Irrigation Intensity (%)			
7	Cropping Intensity (%)			
8	Net area irrigated as % to Net area sown			
9	Gross area irrigated as % to Gross Cropped Area			
10	Total Food grains Production (lakh tones)			

ANNEXURE-6.6

Formats for Agriculture Department

Agro-climatic Zones in Rajasthan

Name of Agriculture Zone	Basins/ District Coverage	Annual Rainfall (mm)		Predominant Cropping Pattern	
		Previous Year	Current year	Kharif	Rabi

Land Use Change Pattern
(Basin-wise or District-wise or Dam Catchment-wise)

S. No.	Classification	Previous Year	Current Year
1.	Net sown area		
2.	Gross Cropped area		
3.	Cropping Intensity (%)		
4.	Cultivable Waste		
5.	Current Fallow		
6.	Other fallow		
7.	Total Geographical Area		

Land Holdings
Basin-wise /District wise and Dam wise Command area

S. no	Classification	Previous year	Current Year
1	Marginal(<1 ha)		
2	Small (1 to 2 ha)		
3	Semi-medium (2 to 4 ha)		
4	Medium (4 to 10 ha)		

S. no	Classification	Previous year	Current Year
5	Large (greater 10 ha)		
	Total		

Area under Important Crops (Annual Average in lakh ha)

S. No	Crop	Previous year	Current Year

Basin-wise / District-wise fertilizer use (lakh tones/year)

Year	Nitrogen	Phosphorus	Potassium	Total

Food grain Production in Basin-wise /District-wise (Million tones/Year)

Year	Food grain Production in Bain /District		
	Kharif	Rabi	Total

ANNEXURE-6.7

Formats for Public Health Engineering Department

S.No		
1.	Basin / District	
2.	Population	
3.	Water supply Scheme	
4.	Population covered under water supply scheme	
5.	Water source (SW- Dam, GW)	
6.	Capacity of water source (MCM)	

District-wise /Basin-wise Water Quality affected Blocks/Villages/Habitations

Year	Fluoride Affected			Nitrate Affected			Salinity Affected		
	Villages	Habitations	Total	Villages	Habitations	Total	Villages	Habitations	Total

District-wise Worst Water Quality Affected Blocks (50% or more)

Year	Fluoride > 1.5 mm	Nitrate>100 ppm	TDS > 2000 ppm	Iron> 1.0 ppm

Coverage of Problematic Villages due to Main Impurity by Different Schemes

District	Main Impurity Fluoride/ Nitrate/ Salinity	No of Problematic Villages	Villages Benefited	
			Number	% age

District-wise/ Basin-wise Status of Water Consumption in Cities/Towns of Rajasthan

Year	No of Cities/ towns in district	Urban Pop	No of cities/ towns covered under piped water supply	Total Water Supply in MLD		Raw Water Treatment Capacity (mld)	
				SW	GW	Existing	Planned

District-wise /Basin-wise Status of Wastewater Generation in Cities/Towns

Year	No of Cities/ towns in district	Urban Population	Total Wastewater Generation in MLD	No of cities/ towns covered under STP	STP Capacity in MLD	
					Existing	Planned

Water Quality Monitoring

S.No	Parameter	Result
	Name of Source	
1.	➢ pH, EC, Cl, F, Fe, Na, Ca, SiO_2	
2.	➢ N,P,K	
3.	➢ Biological Contamination	
4.	➢ Pesticides	
5.	➢ Heavy metals	
6.	➢ BOD ,COD	

ANNEXURE-6.8

Formats for Ground Water Department

District-wise Groundwater Development

Year	Total no of blocks in District	No of Blocks in Different Categories (% of area under different blocks)			
		White (Safe)	Grey (Semi-critical)	Dark (Critical)	Over Exploited

District-wise / Basin-wise Ground Water Resources and Utilization (in MCM)

District/ Basin	Net GW Availability	Per capita GW Availability	Net Draft for				Balance for further use
			Domestic	Industrial	Irrigation	Total	

Water Quality Monitoring

S.No	Parameter	Result
	➢ pH, EC, Cl, F, Fe, Na, Ca, SiO_2	
	➢ N,P,K	
	➢ Biological Contamination	
	➢ Pesticides	
	➢ Heavy metals	

ANNEXURE-6.9

Format for Forest Department

S.No	Parameters	Description
1.	District/ Basin	
2.	Forest Cover (area)	
3.	Forest Type	
4.	Tree Species	
5.	Fauna	
6.	Any Protected Area(PA) in the basin/district	
7.	Name of PA and area	
8.	Is there any Catchment Area Treatment (CAT)Plan for the Dam	
9.	What are the Plantation schemes Under taken	
10.	No. of sapling planted	
11.	Survival Rate	
12.	Water required for plantation (Litres)	
13.	Source of water for plantation	

ANNEXURE-6.10

Format for Command Area Development (CAD) Department

S.No	Parameters	Description
1.	District/ Basin	
2.	Name of Irrigation Project	
3.	Capacity of Dam	
4.	CCA	
5.	Actual Command Area (Irrigated)	
6.	Watering Schedule	
7.	Status of main canal/ distributaries / field channels - lined or unlined	
8.	Irrigation System	
9.	No. of WUA	
10.	Function of WUA	
11.	Revenue collection done by	
12.	Training provided to WUA	
13.	Water logged area	
14.	Area affected by salinity	
15.	Cropping pattern	
16.	Soil Conservation Program undertaken	

ANNEXURE-6.11

Format for Pollution Control Board

Water Quality Monitoring

S.No	Parameter	Result
	Source	
	➢ pH, EC, Cl, F, Fe, Na, Ca, SiO_2	
	➢ N,P,K	
	➢ Biological Contamination	
	➢ Pesticides	
	➢ Heavy metals	
	➢ BOD, COD	

District-wise /Basin-wise Status of Wastewater Generation in Cities/Towns

Basin/District	No of Cities/ towns in district	No. of Industries	Total Wastewater Generation in MLD	No of industries with ETP/CETP	ETP Capacity in MLD	
					Existing	Planned

ANNEXURE- 6.12

CONTENT OF ANNUAL REPORT TO BE PUBLISHED BY SWRPD

It is suggested that an annual report may be published by SWRPD providing on its role & activities and target achieved. The manual must cover basin/district wise environmental targets and achievements. Given below is the table of content for the annual report, which can be modified.

Chapter-1: Introduction

Background of SWRPD
Objective
Previous year achievements

Chapter-2: Institutional Setup and Strengthening

Institutional Setup of SWRPD
Function of various units under SWRPD
Functions of EPPU, Environmental Cell and Water Cell
Workshop/Seminars Held
Staff Trained

Chapter-3: Water Resources Availability

Water Resource Availability in Rajasthan
Surface Water– Available, Utilization, Export/Import(Basinwise / District wise)
Ground water– Available, Extraction, Status (Basinwise / Districtwise)
Water Utilization by PHED – Cities/ towns covered,
Water Demand for Agriculture – Net Area irrigated, Net area sown
Water Demand by Industries- Industrial area and Industries

Chapter-4: Water Quality Status

Water Quality of River Basins (Map of Surface water Polluted)
Groundwater Quality – District / Basin wise
Industrial pollution – Name of Industries, Effluent Quantity, Main Pollutants, Treated Quantity
Status of STP and CETP – Capacity, Quantity treated, Proposed

Chapter-5: Future Action Plan

Water supply – some target to provide potable drinking water, irrigation requirement in critical areas.
Quality Control – Monitoring locations in polluted stretch, Treatment to be undertaken, Policy decision.
Critical area related to water sector – health, salinity & water logging / water distribution / WUA
Awareness Campaigns – Domestic user/ Farmers / industries/ Hoteliers / Water Harvesting / Ground Water Recharge

Chapter-6: Success story

Any case study related to water conservation / quality / participation/ management

Some of the main issues which may be highlighted and the mode of presentation in the Annual Report of SWPRD is highlighted below.

Presentation of Issues in Annual Report of SWRPD

Some of the main issues which may be highlighted and the mode of presentation in the Annual Report of SWPRD.

Chapter – 2:

Capacity Building

S.No.	Name of Staff	Training Institute	Training subject

Chapter -3 Water Availability

Basin Map

Basin wise bar graph for

- ✓ Surface water availability
- ✓ GW availability

Pie graph

- ✓ Extraction of GW and Balance left

Map of GW availability- critical, gray and safe

PHED – Status of Water Supply

S.No	No. of Towns/ Cities	Per capita water available
Total		

Pie graph – water supply schemes

Status of water supply scheme	**No.**
Fully Functional	
Partially Functional	
Defunct	
New proposed	
Under construction	

Water Demand for Agriculture – Bar graph

Status	**Description**
Net irrigated area	

Cropped area	
Pie Graph	
Source of irrigation	Tube well, canal, well,

Water Demand by Industries
Water utilized by the industries
Water utilized by Industrial area
Source of water supply

Water Quality Status
Map of polluted stretch –Surface water
Ground water quality – map showing affected areas

- ✓ Nitrate
- ✓ Fluoride
- ✓ Salinity

Municipal Pollution
Status of STP- Completed, under construction, proposed
Capacity of STP, waste treated and further requirement

Industrial Pollution

Table for Industrial pollution monitoring

Name of Industry	Location / Basin	Water Requirement	Main pollutant	Effluent Discharged	Effluent Treated	Quality of discharged effluent	Capacity of ETP

Any technology adopted by industries for water conservation / reuse

Agricultural Pollution

Basin	Fertilizer consumption	Pesticide consumption

Basins	No. of WUA	No. of Trained Farmers	Name of Training Institute	No. of Vermi-compost in use

Rehabilitation of canal system

www.waterresources.rajasthan.gov.in